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RESEARCH
NOTE

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BITTERBRUSH SEED SPOTTING ON WILDFIRE BURNS[1]

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Wildfire sweeps over many acres of important deer ranges each year. On some of these ranges natural recovery of the important browse plants takes many years—sometimes hundreds of years. This paper reports a study of one possibility for speeding recovery—spot seeding of bitterbrush.

The summer of 1959 was very dry and fires raged through much of California, including many deer ranges. The Clio and Cold Creek fires in Plumas and Sierra Counties were two such fires. Although these two areas support some deer in the winter, they are more typical of summer range than of the winter range on which most of our browse seeding research has been done. Bitterbrush (*Purshia tridentata*) grows on both summer and winter range, but in the burned areas it is part of a mixed brush understory in ponderosa pine (*Pinus ponderosa*) forests rather than part of the sagebrush-bitterbrush type found on most northeastern California winter ranges. Other shrubs in the pine understory are:

greenleaf manzanita	(*Arctostaphylos patula*)
rabbit brush	(*Chrysothamnus* sp.)
curlleaf cercocarpus	(*Cercocarpus ledifolius*)
snowbrush	(*Ceanothus velutinus*)
snowberry	(*Symphoricarpos albus*)
chinquapin	(*Castanopsis sempervirens*)
willow	(*Salix* sp.)

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[1] Contribution from cooperative investigations between the Pacific Southwest Forest and Range Experiment Station and the California Department of Fish and Game. Work was done under Federal Aid in Wildlife Restoration Act. Pittman-Robertson Research Project W51R entitled "Game Range Restoration."

All of these brush species resprouted after the fire except the mountain mahogany and snowberry. Thus the loss of deer food was not as extreme as usual after fires on typical eastside winter range. Even some of the bitterbrush plants sprouted after the fires, but most died the first season (figure 1).

Despite the sprouting of the brush, deer food supplies were severely damaged on parts of the two burns. Personnel from the California Department of Fish and Game and the two National Forests concluded that artificial seeding was needed to speed the recovery of these more seriously damaged areas. Several small study plots were planted cooperatively with the California Department of Fish and Game to determine the best planting prescriptions for these sites.

The steep terrain and dense stands of burned timber ruled out machine planting, the method which has proved best on most of the winter ranges in northeastern California (figure 2). Hand planting was the only possibility. Both spring and fall planting were tested, as well as the effectiveness of endrin-arasan treatment to reduce damage by seed-mining rodents.

STUDY AREAS

The Cold Creek study plot was on Bear Flat, about 5 miles northeast of Sierraville, Sierra County, California, at an elevation of about 6,500 feet. The average annual precipitation is about 26 inches at Sierraville and probably higher at the study area. The fire was not as hot in Bear Flat as it was in some other parts of the Cold Creek area and considerable charred grass sod and litter remained after the burn. Tahoe National Forest personnel spread 1080 poison to control the rodents in this area in the fall of 1959.

The Clio study plot was about one mile east of Clio, Plumas County, California, at an elevation of about 5,000 feet. The average annual precipitation is about 21 inches at Portola, the nearest weather station. The fire was hot enough on the plot to incinerate the soil. There was no 1080 poisoning on this area.

THE STUDY

All spring-planted seed was treated with thiourea to break seed dormancy. Endrin-arasan treated seed was planted on about one-half acre in the fall and on another one-half acre in the spring. Seed spots were spaced 5 feet apart at each location. To detect rodent use, paired spots—one covered with a wire mesh dome and the other uncovered—were planted at each of 100 random locations on each plot (figure 3). To find if the endrin-arasan treatment reduced rodent damage, 100 similarly paired spots were planted with untreated seed in the fall and spring on both burns. These check plots were at least one-quarter mile from the endrin-arasan plantings. Rodents presumably become educated after exposure to endrin-arasan treated bitterbrush seed and thereafter refuse to take any—treated or not. The one-fourth mile separation of plots assured that the same rodents did not use both plots.

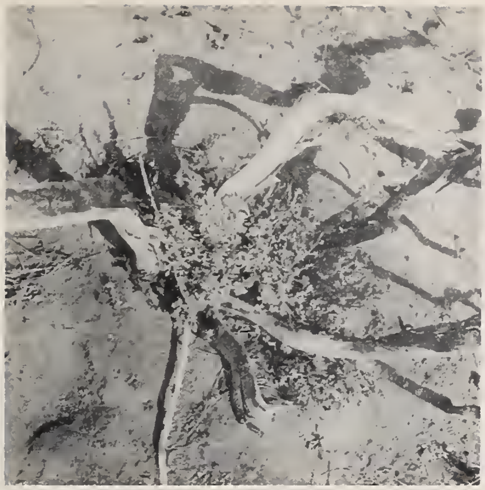

Figure 1.--Bitterbrush plant resprouting after fire. Most of these sprouts died the first season after sprouting.

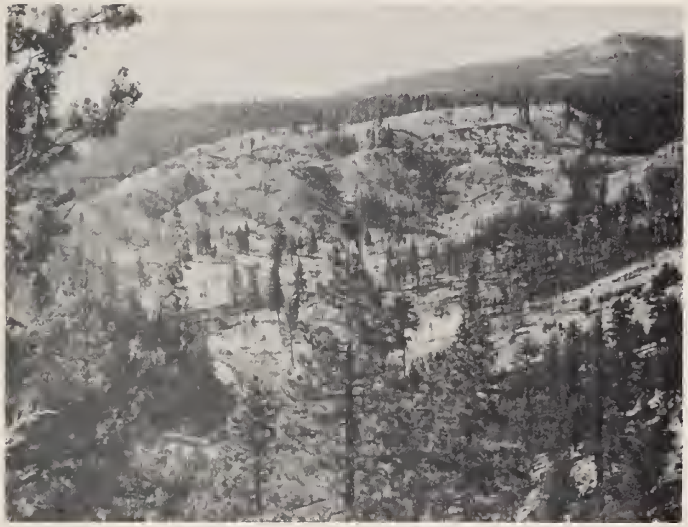

Figure 2.--A view of the typical steep terrain found on much of the Clio and Cold Creek burns. This, along with the large numbers of burned trees, ruled out machine planting.

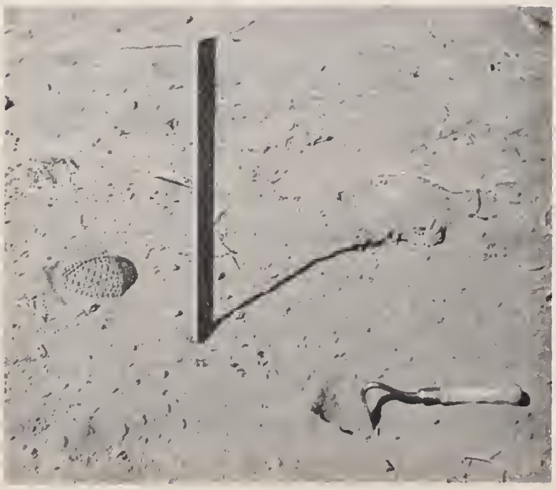

Figure 3.--An example of the paired seed spot used to detect rodent use. The wire mesh dome protects the seed spot on the left from rodent damage while the uncovered seed spot is available for rodent use.

Each spot was dug 1 inch deep with a hand trowel and 5 seeds were placed in the bottom. The seed was covered with soil and the soil firmed by stepping on the spot. This is a slow and cumbersome way of seed spotting but was used because better tools were lacking. A faster, easier job can be done with "corn planter" seeders such as the one designed by Mr. Howard Schussler of the Crookland Seed Company especially for bitterbrush seed spotting (Holmgren and Basile, 1959).

RESULTS AND DISCUSSION

Emergence on the Bear Flat plots in the Cold Creek burn was too low for worthwhile comparisons of fall and spring planting and the endrin-arasan treatment. The reason for the low emergence here is not clear. It was certainly not due to lack of moisture because there was good emergence from a small planting of bitterbrush made for other purposes about a mile from Bear Flat. But enough seedlings emerged at Clio to determine the effectiveness of the endrin-arasan treatment and to compare fall and spring planting.

COMPARISON OF SPRING AND FALL PLANTING

Fall planting proved better than spring planting on the Clio burn. Emergence from covered endrin-arasan seed was 33 percent with fall planting and 25 percent with spring planting. Covered, untreated seed emergence was 27 percent from fall-planted, but only 10 percent from spring-planted seed. The poor emergence from the spring-planted, untreated seed can be partially attributed to soil baking and crusting. Seedlings from fall planting survived better than those from spring planting on both the Clio and Cold Creek areas (table 1). These results give fall planting an edge in both emergence and survival.

ENDRIN-ARASAN EFFECTIVENESS AT CLIO

Rodents dug up untreated seed planted in the fall, as was shown by a statistically significant difference between emergence from covered and uncovered spots on the check plot (tables 2 and 3). Twenty-seven percent of the seed planted under wire domes produced seedlings, but only 14 percent of those planted without protection produced. There was no measurable rodent use on either of the spring-planted plots. This heavier use of fall-planted seed fits our earlier thinking that rodent activity is likely to be more severe on fall than on spring plantings. With fall planting, the seed is exposed longer to rodent activity; and rodent numbers are usually very close to their seasonal peak when fall plantings are made. Spring plantings on the other hand are made when numbers are close to a seasonal low.

The endrin-arasan treatment seemed to prevent rodent damage on the fall planting. Emergence from covered endrin-arasan treated seed was 33 percent while emergence from uncovered seed was 38 percent. This slight increase was not statistically significant.

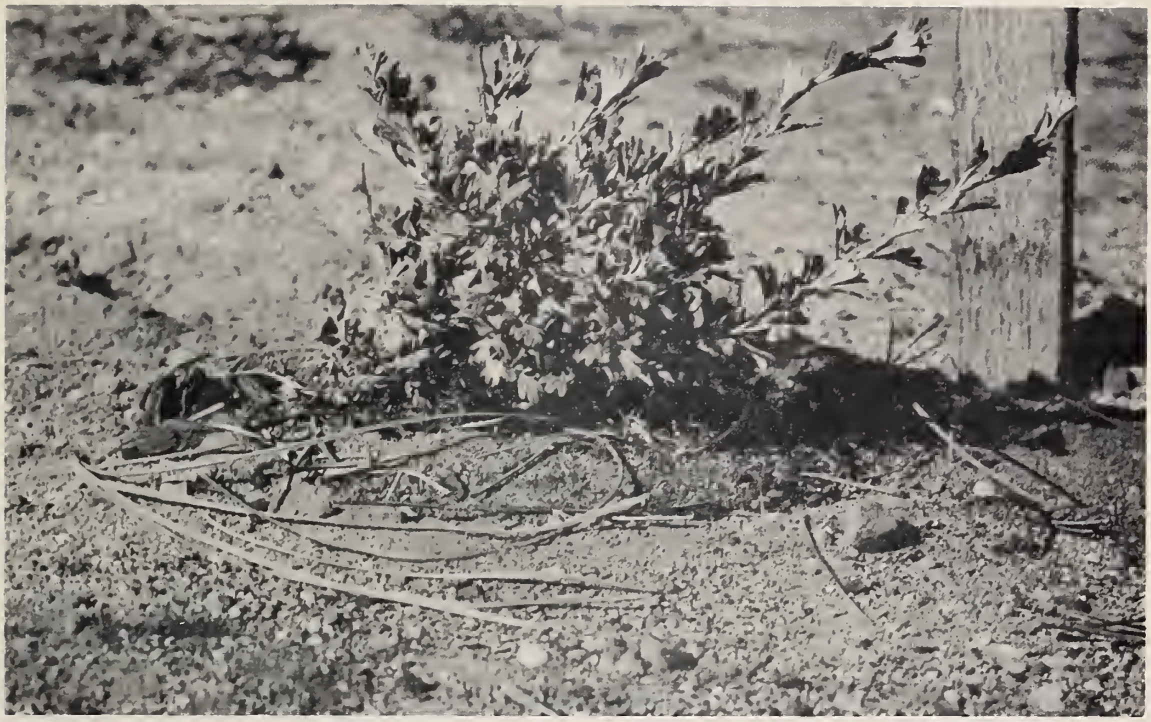

Figure 4.--A successful seed spot.

WERE THE PLANTINGS SUCCESSFUL?

Generally we have considered any planting showing more than 500 plants per acre a definite success. Fewer plants per acre produce some herbage, but not enough, in our opinion, to pay the cost of planting. With seed spotting, the number of successful spots determines stocking rate because a spot counts as only a single plant whether there are 1, 2, or more individuals in it (figure 4). Using these criteria, all of the Bear Flat plots must be classed as failures (table 4). Both fall plantings on the Clio were successful. The endrin-arasan spring planting was successful but the check was not. It was mentioned earlier that the failure of this spring check was largely due to soil baking.

Under conditions similar to those found on the Clio burn we recommend spot plantings in the fall with endrin-arasan treated seed. While spring planting has been found best on many winter ranges (Hubbard, et al., 1959), the soils on these ranges are generally heavier and hold the moisture longer than the soils on the Clio burn. The recommendation for fall seed spotting with endrin-arasan treated seed corresponds with that made by Idaho researche for similar conditions (Holmgren and Basile, 1959).

Table 1.--Percent survival of seed spots with one or more seedlings

Area and planting method	Endrin-arasan			No treatment		
	June	September	Percent survival	June	September	Percent survival
CLIO BURN						
Fall planting						
Covered[1]	75	65	81	70	56	80
Uncovered	77	71	92	41	29	70
Spring planting						
Covered	58	41	71	29	20	69
Uncovered	58	39	67	28	13	46
COLD CREEK BURN						
Fall planting						
Covered	20	10	50	26	17	65
Uncovered	5	0	0	26	8	31
Spring planting						
Covered	12	2	17	5	1	20
Uncovered	6	0	0	6	0	0

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[1] Wire domes used to protect against rodents.

Table 2.--Analysis of variance of emergence from the Clio and Cold Creek experimental seed spot plantings

Source of variance	d.f.	M.S.	F.
TOTAL	15		
Treatment	1	86.82	3.33
Season	1	276.81	10.62**
Covered[1] vs. uncovered	1	52.17	2.00
Area	1	2,772.29	106.34**
ERROR	11	26.07	

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[1] Wire domes used to protect against rodents.
** Significant at the .01% level.

Table 3.--Emergence on the Clio and Cold Creek burns

Area and planting method	Percent of planted seed producing seedlings	
	Endrin-arasan	No treatment
CLIO BURN		
Fall planting		
Covered[1]	33	27
Uncovered	38	14
Spring planting		
Covered	25	10
Uncovered	27	9
COLD CREEK BURN		
Fall planting		
Covered	6	8
Uncovered	1	9
Spring planting		
Covered	4	2
Uncovered	1	1

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[1] Wire domes used to protect against rodents.

Table 4.--Number of successful seed spots per acre on the Cold Creek and Clio burns at the end of the first growing season

Area and planting method	Endrin-arasan	No treatment
CLIO BURN		
Fall planting		
Covered[1]	1,170	968
Uncovered	1,278	522
Spring planting		
Covered	738	360
Uncovered	702	234
COLD CREEK BURN		
Fall planting		
Covered	306	180
Uncovered	114	0
Spring planting		
Covered	18	36
Uncovered	0	0

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[1] Wire domes used to protect against rodents.